

CLAIMS

What is claimed is

1. A digital camera with depth of field-improving properties, provided with an objective for
5 reproducing a scene composed of objects within a field of view at different object distances in front of
said lens, a focus-selector for preselection of states of focus and a focusing device for focusing the
camera at different ranges, at least one electronic image detector having entrance plane for detection
and recording of image information corresponding to images of said scene and an associated image-
sharpness detector located inside the camera or somewhere else, **characterized by:**
 - 10 a/ said image detection being arranged in such a way that image information, corresponding to at least
two differently-focused images, i.e. with a relative difference in state of focus and depicting the same
scene, is being registered,
 - b/ the focusing device being arranged for simultaneous, or in successive time-sequential automatic
order, focusing of the camera at respective preselected object-distances, and this being synchronized
15 to said ongoing image-detection,
 - c/ means being arranged for having said image-sharpness detector, directly or indirectly from each set
of said corresponding differently-focused images select, extract and forward such parts/portions of the
image information, contributing to the most optimal image resolution and merge said select image
information from corresponding images into a final image having better image resolution than each
20 individually focused image record by itself, and this resultant image being registered in a terminal
memory and/or being presented on a permanent medium and
 - d/ the camera being provided with at least one viewfinder
2. Digital camera with lens for depicting a scene being composed of objects within a field of view,
25 at various ranges in front of the same objective and a focusing device for focusing the camera at
different distances, at least one electronic image detector with entrance plane for detection and
register of image information corresponding to an image of the scene being depicted, an image-
sharpness detector and at least one camera viewfinder, **characterized by**
 - a/ the said focusing device being arranged for focusing this instrument simultaneously, and/or in time-
30 sequence, at different object-distances,
 - b/ the image detection being arranged in such a way that at least two differently-focused images, i.e.
with mutually different states of focus and depicting the same scene, are being detected,
 - c/ means having been allocated for letting said image-sharpness detector, directly or indirectly and
from each such set of corresponding differently-focused images, select/extract and forward such
35 components/parts of the image information, which contribute to the most optimal picture definition
and let this said select image information from sets of mutually corresponding pictures merge into a
final image with better resolution than the differently-focused images detected individually and

d/ means being allocated for visualizing an electronic image in the viewfinder, being generated from at least one of said differently-focused images.

3. A camera of claim 1 or 2 **characterized by** means being arranged for visualizing an electronic
5 image in the viewfinder, constituting a superposition of at least two of said differently-focused images into one common average-image which has a more extended depth of field than each of the differently-focused images individually, and said average-image being forwarded to the electronic viewfinder for image-presentation.

10 4. A camera of claims 1-3, **characterized by** means being arranged for visualizing an electronic viewfinder-image, generated by at least one registration at shorter objective focal-length, than for said image registration by the camera.

5. Digital camera with lens for depicting a scene being composed of objects within a field of view,
15 at various ranges in front of the same objective and a focusing device for focusing the camera at different distances, at least one electronic image detector with entrance plane for detection and register of image information corresponding to an image of the scene being depicted, an image-sharpness detector and at least one optical camera viewfinder, **characterized by**
a/ the said focusing device being arranged for focusing this instrument simultaneously, and/or in time-
20 sequence, at different object-distances,
b/ the image detection being arranged in such a way that at least two differently-focused images, i.e. with mutually different states of focus and depicting the same scene, are being detected,
c/ means having been allocated for letting said image-sharpness detector, directly or indirectly and from each such set of corresponding differently-focused images, select/extract and forward such
25 components/parts of the image information, which contribute to the most optimal picture definition and let this said selected image information from the same set of mutually corresponding pictures merge into a final image with better resolution than the differently-focused images detected individually and
d/ the optical viewfinder being arranged for viewing without diffusive focusing screen, implying an
30 improvement of viewfinder-depth of field, this being due to the intrinsic accommodation- and/or aperture reduction ability of a human pupil when performing ocular observation.

6. A camera of claim 5, **characterized by** an optical viewfinder with a focusing screen for projecting the scene onto a viewfinder image-plane, and that means have been arranged for transporting this
35 screen out of the ray path.

7. A camera of any previous claim, **characterized by** means being arranged for reduction of a viewfinder aperture.
8. A camera of any previous claim, **characterized by** means being set up for a viewfinder to
5 superpose images, which have been differently focused by optical means, and this generating a joint, merged viewfinder-image with better depth of field-properties, than said individual images.
9. A digital camera with objective for depicting a scene in front of said lens, at least one electronic image-sensor with entrance plane for detection and register of image information corresponding to an
10 image of said scene being depicted and said camera having at least two view-finders for control of image composition and/or focusing of the camera, **characterized by** means being allotted for letting the two camera-viewfinders use one eyepiece in common.
10. A camera of any previous claim, **characterized by** means being arranged for letting at least part
15 of the viewfinder ray-path utilize the camera objective.
11. A camera of any previous claim, **characterized by** means having been allotted for deviation of a viewfinder ray-path, away from a common symmetry-line through the camera-lens, by means of a beamsplitter with optional reflectance, i.e. generating either at least two simultaneous ray-paths or is
20 totally reflecting said viewfinder ray-path.
12. A camera of claim 11, **characterized by** means being arranged for deviating the viewfinder-raypath, from a symmetry line in common with the camera lens, using a beamsplitter component which is movable inbetween one position within the camera-lens beam and another position outside
25 said light-beam.
13. A camera of any previous claim, **characterized by** an electronic viewfinder image being visible from at least two different directions and electronic means being arranged in order to rotate said finder view or perform an inversion.
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14. A camera of any previous claim, and with an image-selector, **characterized by** means being arranged for optional presentation/display in a viewfinder of each individual, differently-focused image and that this choice is controllable with said image selector.
- 35 15. Digital camera with lens for depicting a scene being composed of objects within a field of view, at various object-distances in front of said objective, a focus-selector and a focusing device for setting the focus of the camera at different distances, at least one electronic image detector with

- entrance plane for detection and register of image information answering to an image of the scene being depicted, plus an associated image-sharpness detector, **characterized by**
a/ said focusing device being arranged for simultaneous focusing of this instrument at different object-distances, and/or a time-sequential focusing procedure is being used. .
- 5 b/ an image detection being arranged in such a way that image information equivalent to at least two differently-focused images, i.e. with mutually different states of focus and depicting the same scene, are detected,
c/ means being allocated for letting said image-sharpness detector, directly or indirectly and from each such set of corresponding differently-focused images, select/extract and forward such
10 components/parts of the image information, which contribute to the most optimal picture definition and let this said selected image information from the same set of mutually corresponding pictures, merge into a final image with better resolution than the differently-focused images detected individually and
d/ means being arranged for selecting individual focus-distances, using said focus-selector, answering
15 to at least one of said differently-focused images, this constituting an optional preselection of individual states of focus, before image registration takes place.
16. A camera of claim 15 in continuous mode, i.e. with capacity to perform a swift time-sequential succession of exposures and further means being allotted to control and drive said focusing device by
20 using an electronic driver-module, **characterized by** means being arranged for automatic setting of the camera focus at said preselected states of focus, while image detection, i.e. said exposures, are going on.
17. A camera of claims 15 or 16 and with additional motion-sensor, calibrated counter and electronic
25 processor, **characterized by** means being arranged for said driver-module to electrically drive the transport of such optical elements or image-sensors, being primarily responsible for refocus and that said calibrated counter is arranged for registration of current location of said focusing elements and that this information is interacting with the processor in a procedure of converging said motion towards a required state of focus.
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18. A camera of any previous claim, furnished with a picture-number selector, **characterized by** means being set up for selecting the number of images/exposures required for an image-sequence, by using said selector.
- 35 19. A camera of any previous claim, furnished with a focus-registrar contrivance and at least one focus-memory, **characterized by** means being arranged for registration of single states of focus as well as sets of such priority-states and furthermore forward such information to said memory for saving.

20. A camera of claim 19, furnished with a focus-retrieval contrivance, **characterized by** means being provided for selecting and retrieving information from said focus-memory, this information constituting registered sets about focal states or parts thereof, i.e. in-data for controlling said focusing device.
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21. A camera of claim 19 and provided with a focus-indicator, **characterized by** means being arranged for visual indication of state of focus, being registered in said memory.
22. A camera of claim 19 with a nullifier contrivance, **characterized by** means being adopted for an electronic reset of said focus-memory, constituting an erasure of said registered states of focus.
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23. Any camera of claims 14-22 and provided with a universal-knob or other control, **characterized by** at least two functions of said: image selection, picture-number selection, focus-registration, focus-retrieval, memory-reset and image detection, to be controllable with the same knob or control-unit.
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24. A camera of any previous claim with an interval-selector contrivance, **characterized by** means being arranged for selecting at least one operational object-distance interval, corresponding to the focusing interval within which image detection is arranged to take place.
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25. A camera of any previous claim, **characterized by** means being arranged for automatic setting of said differently-focused images, following a programmed, preselected scheme for focus-distances, the preferable distribution of these being optimally even, from a depth of field-standpoint, and this constituting a set of standard focuses.
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26. A camera of any previous claim and furnished with a proximity-selector contrivance, **characterized by** means being allotted for setting the nearest focus-distance allowed during image-detection, and this being controllable with said proximity-selector, and said procedure constituting an optional preselection.
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27. A camera of any previous claim, having optimal-focus-selector and depth of field-selector contrivances, **characterized by** means being arranged for selecting and focusing within the field of view with said focus-selector, on at least one object or distance of preference, for optimal image resolution and to furthermore set the depth of field-selector for an object-distance interval of priority, within which depth of field-improvement is being arranged and this said interval being located in front of and/or behind said object/distance of preference.
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28. A camera of claims 24-27 and provided with an electronic image blur-function characterized by means being arranged for defocusing image-parts outside said object-distance intervals by using said blur-function, or replace said image parts with some other picture.

5 29. A camera of any previous claim and with more than one image-sensor, characterized by means being arranged for electrical connection inbetween sensors in order to accomplish a common read-out.

10 30. A camera of any previous claim, characterized by said camera-objective consisting of a permanently attached lens on the camera plus means being allotted for attachment of a detachable afocal add-on lens with fixed or variable magnification.

15 31. A camera of any previous claim, characterised by an image-sensor of the camera having at least two mutually in parallel detector planes and that these surfaces are separated in order to register differently-focused images, one at each such plane.

20 32. A camera of any previous claim, characterized by means being allocated for said selection/ extraction of image information by using said image-sharpness detector and by utilizing said template- or image-comparison technique, and where said image-registration for respective final image and template image are independent, separate recordings and at least one of the camera settings like exposure-time, aperture size, focal length and image sensor-sensitivity differ inbetween these two separate registrations.

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